REMARKS

This is responsive to the Official Action mailed June 22, 2006. Claims 1-8 remain active.

The Examiner objected to the drawings and requested corrected drawing sheets. In order to overcome this objection, replacement drawing sheets have been attached to this response.

The Examiner rejected the claims under 35 U.S.C. §103(a) as being unpatentable over the Japanese reference (404165269) in view of Acharya et al. (U.S. 6,644,038) ("Acharya"). Applicant's invention as recited in claim 1 is a method for operating a pulse tube cryocooler system containing working gas at a mean pressure and driven by a pressure wave generator or at a frequency up to 500 hertz. In accordance with the method, after experiencing a change in the mean pressure of the working gas, the frequency of the pressure wave generator is changed directly with a change and the mean pressure of the working gas.

Applicant submits that the Japanese reference has no provision for changing the frequency of the pressure wave generator. Acharya adds nothing on this point in that as the Examiner notes, Acharya's disclosure is linear motors in the use of helium as a working fluid.

More specifically, as indicated in the instant specification, predicted cryocooler performance can be influenced by mean pressure fluctuations within working fluid. These pressure fluctuations can be caused by change in temperature that therefore changes the pressure of the cooling medium within the cryocooler or a small leak of the working fluid. As indicated in paragraph 28, in a cryocooler there are both stroke and current input limitations for the pressure wave generator. If the pressure falls, the input power must be reduced in order to continue operating within the stroke limitations. An increase in pressure results in a cryocooler operating at its maximum allowable current. An increase in power input will decrease cryocooler performance. In order to overcome this, as recited in claim 1 and as specifically pointed out in paragraph 29, as the mean pressure falls, the frequency is decreased to a point that the pressure wave generator is operating at full current and stroke. In such manner, the power input to the pressure wave generator is maximized along with the refrigeration produced by the cryocooler.

In contrast to this, as mentioned above, in the Japanese reference, cryocooler frequency is never adjusted. The Japanese reference shows a cryocooler having a pulse wave generator 9, a regenerator 14, a pulse tube 17 and an impedance network consisting of an orifice 22 and a compliance volume 20 generating the proper phase angle between the gas flow and pressure oscillation within the pulse tube. Also incorporated in the Japanese reference is a work recovery scheme. It is to be noted that in any cryocooler, the pulse wave generator produces standing waves of both pressure and mass flow. It is important that these waves closely match in order for the cryocooler to generate refrigeration. The impedance network, is so called, because it has an operation that is analogous to an electrical R-L-C network in which the orifice, for example, is a resistor to pressure that is analogous to voltage and the compliance volume is analogous to a capacitor.

The energy imparted to the working fluid is to some extent dissipated within the impedance network. In order to recover the energy that would otherwise be lost, also incorporated in the Japanese reference is a work recovery scheme. In order to recover some of the work of compression, line 23 is provided. However, the phasing of the returned stream is also critical. For example, the pressure wave and mass flow wave, as imparted by piston 11, must be in phase with the pressure wave and mass flow wave within the fluid within line 23. Otherwise the pressure wave within line 23 will be subtractive and no work will be recovered. Thus, line 23 must be tuned in an analogous manner to the impedance network. This is accomplished in the Japanese reference by a valve 24. As indicated in the Japanese reference, when the solenoid valve 24 is in a closed position and the speed of the pressure drop of the compressor is too fast, the insufficient speed of the return of the refrigerant is decided and the solenoid valve 25 is adjusted automatically. The speed of the pulse wave generator is not adjusted and there is nothing in this reference to indicate such adjustment. Consequently, the Examiner's rejecting combination of the Japanese reference and Acharya does not render claim 1 unpatentable.

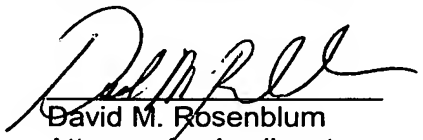
Since claim 1 is in allowable form, the remaining dependent claims, namely claims 2-8 be allowable on the same basis.

Applicant is aware that this response is being made within the first month, therefore, Applicant has enclosed herewith a petition to extend the time to

answer in the first month together with directions to charge the Assignee of record's deposit account no. 16-2440 with the appropriate fee.

In view of the remarks set forth above, Applicant requests reconsideration of the rejection and allowance of all presently pending claims. Since the claims are in condition for allowance, prompt and favorable action is hereby solicited.

Respectfully submitted,



David M. Rosenblum
Attorney for Applicant
Reg. No. 29,341

39 Old Ridgebury Road
Danbury, CT 06810
(203) 837-2116

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Attachments: Replacement drawing sheets